

Mr. Horatio Hale's object in the essay before us is to show that language separates man from all other animals by a line as distinct as that which separates a tree from a stone, or a stone from a star.

"A treatise," he writes, "which should undertake to show how inanimate matter became a plant or an animal, would, of course, possess great interest for biologists, but it would not be accepted by them as a treatise on biology. In like manner a work displaying the anatomy of man in comparison with that of other animals cannot but be of great value, and a treatise showing how the human frame was probably developed from that of a lower animal must be of extreme interest; but these would be works, not of anthropology, but of physiology or biology. Anthropology begins where mere brute life gives way to something widely different and indefinitely higher. It begins with that endowment which characterizes man, and distinguishes him from all other creatures. The real basis of the science of anthropology is found in articulate speech, with all that it indicates and embodies." He does not hesitate to maintain that solely by their languages can the tribes of men be scientifically classified, their affiliations discovered, and their mental qualities discerned. These premises, he says, compel us to the logical conclusion that linguistic anthropology is the only "Science of Man."

These words explain at once the whole character of this important essay. Mr. Horatio Hale is a great admirer of Darwin, but not of the Darwinians. He contrasts Darwin's discernment of the value of language with the blindness of his followers, who are physiologists and nothing else. Why anthropology has of late been swamped by physiology, Mr. Horatio Hale explains by the fact that the pursuit of the latter science is so infinitely the easier. "To measure human bodies and human bones, to compute the comparative number of blue eyes and black eyes in any community, to determine whether the section of a human hair is circular, or oval, or oblong, to study and compare the habits of various tribes of man, as we would study and compare the habits of beavers and bees, these are tasks which are comparatively simple. But the patient toil and protracted mental exertion required to penetrate into the mysteries of a strange language, and to acquire a knowledge profound enough to afford the means of determining the intellectual endowments of the people who speak it, are such as very few men of science have been willing to undergo." Mr. Horatio Hale has a right to speak with authority on this point, for, besides having studied the several languages of North America, of Australia and Polynesia, no one has more carefully measured skulls, registered eyes, measured hair, and collected antiquities and curiosities of all kinds than he has done during his long and busy life. His knowledge of the customs of uncivilized races is very considerable. No one knows the Indian tribes and likewise the Australians better than he does, and he is in consequence very severe on mere theorizers who imagine they have proved how the primitive hordes of human beings, after herding together like cattle, emerged slowly through wife-capture, mother-right, father-right, endogamy, exogamy, totemism, fetichism, and clan systems, to what may be called a social status. He holds with Darwin that man was from the beginning a pairing animal, and that the peculiar usages of barbarous tribes are simply the efforts of men, pressed down by hard conditions, below the natural stage, to keep themselves from sinking lower. He gives a most graphic description of changes of civilization produced by change of surroundings in the case of the savage Athapascans, and their descendants, the quick-witted and inventive Navajos. He holds that the inhabitants of Australia were originally Dravidians, and that their social and linguistic deterioration is due to the miserable character of the island in which they had taken refuge, possibly

from the Aryans, when pressing upon the aboriginal inhabitants of the Dekhan. He points out a few grammatical terminations in the Dravidian languages which show some similarity to the terminations of Australian dialects. The dative, for instance, is formed in the Dravidian Tulu by *ku*, and in the Lake Macquarie and Wiradhurei dialects of Australia by *ko*. In both families the *k* of *ku* and *ko* is liable to be changed into *g*. The plural suffix in Tamil is *gal*, in Wiradhurei *galan*. Thus in Tamil *maram*, tree, forms the nom. plur. *marangal*, the dat. plur. *marangaluk-ku*; while in Wiradhurei, *bagai*, shell, appears in the nom. plur. as *bagaigalan*, in the dat. plur. as *bagaigalan-gu*. On this point, however, Mr. Horatio Hale ought to produce fuller evidence, particularly from numerals, and the common household words of uncivilized tribes. The pronouns show many coincidences with Dravidian and Australian languages. No one is better qualified for that task than he is, for we really owe to him the first trustworthy information about the Australian dialects. He considers all the dialects spoken in Australia as varieties of one original speech, and he has proved their wonderful structure by several specimens contained in his first book, published nearly fifty years ago, and again in this last essay of his.

There is no doubt that this essay will provoke much opposition, but no one can read it without deriving most valuable information from it, and without being impressed with the singularly clear and unbiassed judgment of the author. It is to be hoped that if there is any controversy it may be carried on in the same scientific and thoroughly gentlemanlike tone in which Mr. Horatio Hale deals with those whom he has to reprove. Thus, when Prof. Whitney, a fertile writer on linguistic science in America, commits himself to the statement that the Dravidian languages have "a general agglutinative structure with prefixes only," Mr. Horatio Hale good-naturedly remarks, "this is doubtless a misprint for *with suffixes only*." And when Prof. Gerland, in his continuation of Waitz's invaluable work "Die Anthropologie der Naturvölker," refers to Mr. Horatio Hale as describing the hair of the Australians as *long, fine, and woolly*, he points out that he, on the contrary, described their hair as neither woolly, like that of the Africans and Melanesians; nor frizzled, like that of the Feejeeans; nor coarse, stiff, and curling, as with the Malays; but as long, fine, and *wavy*, like that of Europeans. He naturally protests against Prof. Friedrich Müller charging him with having committed such a blunder, which, as he remarks, would be as bad as if he had described the Eskimos as having black skins. But there is not a single offensive expression in the whole of his essay, though the opportunities would have been many for adopting the style of hitting indiscriminately above and below the belt. Though he differs from Prof. Whitney, he evidently ranks him very high, and as second only to "that eminent Sanskrit scholar, Sir Monier Monier-Williams."

LEWIS MORRIS RUTHERFURD.

ON May 30 last there passed away from us one whose name was familiar to many, and who was respected and beloved by all who were fortunate enough to have made his acquaintance. By the death of Lewis Morris Rutherford, who died at the age of seventy-six, at his estate in Tranquillity, New Jersey, astronomical science especially suffers, for he was one of the pioneers of astronomical photography and spectroscopy, and the introducer of many of the practical methods which have opened to us such a vast field of research.

Born at Morrisania, New Jersey, on November 25, 1816, he first devoted himself to the study of law, but finding his mind bent more on astronomical pursuits,

he soon thought fit to leave this profession, and being well equipped with the necessary private resources, he commenced in the year 1848 to erect an observatory in the city of New York at his own residence. On its completion, it was furnished with an 11½-inch refractor, which he had made under his own personal direction by Fitz, and a transit instrument.

The first work he set himself to do related to the spectra of the stars. As soon as Kirchhoff's discovery was announced, Donati, at Florence, in 1860, made the first efforts in this direction; this was followed by other observers, among whom was Rutherford. In 1863 he published his first paper on the spectra of the celestial bodies, and indicated that the various stellar spectra which he had then observed were susceptible of being arranged in different groups. His paper, which was published in *Silliman's Journal*, vol. xxxv. p. 71, contained the following extract with reference to this classification:—"The star spectra present such varieties that it is difficult to point out any mode of classification. For the present, I divide them into three groups: First, those having many lines and bands, and mostly resembling the sun, viz. Capella, β Geminorum, α Orionis, &c. These are all reddish or golden stars. The second group, of which Sirius is the type, presents spectra wholly unlike that of the sun, and are white stars. The third group, comprising α Virginis, Rigel, &c., are also white stars, but show no lines; perhaps they contain no mineral substance, or are incandescent without flame."

Turning his attention to object-glasses for visual and photographic purposes, he described in 1865 a new form which he had specially designed for the latter. This, needless to say, brought about a great revolution in the processes employed. The history of his early attempts to produce photographically corrected object-glasses, and the wonderfully sharp and beautiful photographs of the moon which he finally obtained, will always be marked as an important era in the application of the camera to the equatorial telescope. The photographs taken at the present day, even although they are produced with larger lenses and with a more perfect knowledge of photographic processes, and with the advantages afforded by dry plates, excel only in a trifling degree those taken with the small Rutherford equatorial.

Another important piece of work, which occupied him some considerable time, was the mapping, by means of the photographic process, of star clusters and star groups. His ingenuity in devising and constructing accurate micrometers for measuring the impressions of the star clusters opened out a new method by which the proper motion of the stars could be photographically determined, and even their parallaxes, eliminating entirely the errors of observers.

It was absolutely essential, as he knew, in order to obtain a perfect method of measurement of the photographs, to attain the utmost perfection in the cutting of the threads of the micrometer screw, and some idea of the care which he bestowed on them may be gathered from the fact that he took three years to make a single screw. In order to test its quality, it struck him that it would be a happy thought to see if it would enable him to rule a grating. He accordingly set the apparatus up in his bedroom, and by means of an automatic arrangement kept it going all night, as at that time the local vibrations were fewest. The result was that he was able to make the most perfect gratings known, which are only now surpassed by those of Rowland, who followed in his wake.

The photographic corrector, which consisted of an additional lens to be applied to visual object-glasses, to render them fit for photographic use, was also due to his exceptional mechanical ability, and was brought out in the year 1868.

Owing to failing health he was at last obliged to give

up all idea of making observations, so he resigned himself to a thorough supervision of the great number of measurements of the photographs of the star clusters that by this time had very considerably accumulated.

In the year 1884, Columbia College, New York, was the recipient of all his astronomical instruments, apparatus, and completed measures. It is only a fortnight ago when a notice of the measures of the Pleiades, which were prosecuted by Mr. Jacoby, under the direction of Prof. Rees, was made in these columns, and it will not be long before several other clusters will be published.

In this brief notice we have only referred to some of the more salient points with which he enriched the domain of astronomical science; and his was no mean spirit striving to confine to his own use the various methods of work and improvements he introduced: he scattered his gratings with a lavish hand among all who were likely to make any use of them, and his greatest delight was to help others occupied in researches kindred to his own.

NOTES.

SIR ARCHIBALD GEIKIE has been appointed by the Council of the Royal Society to be one of the Governors of Harrow School.

It was with deep regret that we saw the announcement in Monday's *Times* of the death of Admiral Mouchez, the Director of the Paris Observatory. In him France has lost one of her most active men of science, whose place it will be no easy task to fill.

AT St. John's College, Cambridge, on July 9, at 2.30 p.m., there will be held a meeting of the General Committee that was formed for placing a suitable memorial of the late Prof. Adams in Westminster Abbey. This meeting is specially called to consider a modification in the form of the memorial. The resolution, as passed in February, was to the effect that the memorial should "consist of a bust with tablet and inscription," but as the Dean has been unable to sanction any site in that part of the Abbey in which it was first proposed to be placed, but has offered an excellent position for a medallion, near the monument of Newton and the grave of Sir John Herschel, and close to the memorials of Darwin and Joule, the Executive Committee recommend that this offer be accepted, and that the terms of the former resolution be altered to "That the memorial consist of a medallion and inscription."

THE *Botanische Zeitung* publishes a programme of the International Botanical Congress to be held in Genoa. On Sunday evening, September 4, there will be a reception of the foreign botanists present. On Tuesday the Botanical Institute and Garden, presented to the Municipality of Genoa by Mr. Thos. Hanbury, will be formally opened. On Saturday, September 10, the Acclimatisation Garden of Mr. Hanbury at Mortola will be visited. The rest of the week will be occupied by scientific sittings, receptions, and excursions.

DR. BENECKE, the Director of the Experimental Station at Klaten, Java, has offered a prize of 1000 marks for the best essay, founded on original observations and experiments in cultivation, on the causes of the red colour in the fibrovascular bundles of *Sorghum*, which accompanies the disease known as "sereh." A very similar disease has recently become very destructive to the sugar-cane crop in Java.

IN our account last week of the Ladies' *Conversazione* of the Royal Society we stated that the Telephone Company's installation was the means by which the music from the Paris opera was rendered audible. This, as we have reason now to know, was incorrect. The Post Office undertook the whole affair, no company having anything at all to do with it.